Program Review
College of Natural Sciences
University of Hawaii, Manoa
Final Report: May 12, 2014

Review Team
James Hildreth, Dean, College of Biological Sciences
University of California, Davis

Jeffrey Roberts, Dean, College of Science
Purdue University

Robert Schnabel, Dean, School of Informatics and Computing
Indiana University, Bloomington

Hal Stern, Dean, Donald Bren School of Information and Computer Sciences
University of California, Irvine
College of Natural Sciences

The College of Natural Sciences (CNS) is comprised of seven academic departments (Biology, Botany, Chemistry, ICS, Mathematics, Microbiology, and Physics/Astronomy). CNS programs are large; more than 12% of the campus’ student population is enrolled in CNS programs (14% of campus undergraduates and 8% of graduate students). As the College also teaches many gateway courses that serve students in other majors on campus the undergraduate teaching load is even heavier with CNS accounting for 17% of all undergraduate student-semester hours. The external review team consisted of four deans from large public universities. The team reviewed college and department self-study documents before arriving in Hawaii. We spent two days meeting with representatives of the administration (Vice Chancellor of Academic Affairs, Dean of CNS, other Arts and Sciences Deans, Vice Chancellor for Administration, Graduate Dean, representatives of the Undergraduate Education Office, staff from the Assessment Office), department chairs, faculty, staff, graduate students, and undergraduate students. We are grateful to the Vice Chancellor of Academic Affairs and his staff for their support of the review team. The visit was planned and executed extremely well.

This portion of the report addresses concerns that pertain to the College as a whole or to a significant fraction of the Departments in the College. It is followed by reports on individual departments addressing issues specific to each.

Reviews of this nature focus a great deal of attention on suggestions and recommendations to enhance the stature of the unit under review. This is appropriate but it is also important to note the many positive aspects of the departments and college and especially the positive developments in recent years. The review team is impressed by Dean Ditto. He has been energetic and creative in moving the college forward where he has the ability to do so. Faculty and staff both expressed great confidence in Dean Ditto and appreciate the steps that he has taken thus far. There are numerous success stories in teaching and research across the College in sometimes challenging circumstances. The College has been hiring a great deal recently and the review team was impressed by the quality and productivity of the new faculty members. We found through our discussions with the students, faculty and staff that the staff is extremely dedicated to their work and to the College. They are a real asset. The remainder of the report identifies specific areas where we believe there are opportunities for the College to build upon the progress they have made during the last several years.

Planning

The College has recently hired a substantial number of new faculty members and will continue to do so for the next several years. This provides an important opportunity for the College. Conversations with departments suggested that it would be valuable to develop a strategy to make the most of the recruitments. For the most part Departments did not identify specific areas of excellence nor target areas they would like to develop. It is critical that the College and Departments plan carefully with respect to the current hiring phase. Bringing science to bear
on the important challenges facing society (e.g., energy, environment) requires interdisciplinary approaches. This will require departments to coordinate hiring and work together on recruitments. The need for planning extends well beyond faculty recruitment though. CNS carries a heavy teaching and advising load. The College should be aggressive in trying to get a new budget model to appropriately reflect the effort associated with instruction and degree production. The College should also pursue stronger collaborations with organized research units as this will benefit both groups. The Dean has identified a number of other important goal areas: increased research funding, goals for the CNS advising program, etc. It is important to set specific goals in each area (e.g., amount of research funding, graduation rate, staffing levels) and develop plans to achieve these goals. We believe it is important that the College develop a strategic plan to guide College decisions and actions. This need not involve a major time-consuming planning process resulting in a book-length document but it should engage the College and provide enough detail to make the vision clear. This is summarized in the recommendation below:

**Recommendation:** The College of Natural Sciences would benefit from increased attention to strategic planning (in concert with the Chancellor and the Vice Chancellor – Academic Affairs). Plans should, among other things:

- set specific goals in important areas (e.g., target research funding, graduation rate, staffing levels);
- identify areas of excellence (or target areas to develop) in which to hire;
- encourage collaboration across departments in the College and with relevant units outside CNS;
- identify and exploit features that are unique to the local environment where UH may expect to have a competitive advantage over peer institutions;
- explore ways to connect campus organized research units and the academic departments in CNS to the benefit of both;
- develop an integrated strategy to enhance student success (advising, research, internships, etc.);
- pay careful attention to faculty, staff and student diversity and to supporting a diverse student population.

**Incentivizing Excellence**

The College of Natural Sciences carries a heavy teaching burden and has a large number of undergraduate majors. Our understanding is that the College’s budget has remained the same even as this workload has increased substantially in recent years. The review team believes it is important that the campus budget model be modified so that budget allocations are more responsive to changes in workload. This would create an incentive for CNS (and other campus units) to continue growing and innovating. We understand that budget discussions along these lines are underway and encourage this discussion to continue. The need for incentives extends beyond the needs of the College. The Dean has recently put in place a program to return
summer instructional revenue above a baseline back to Departments. This is an excellent example of an incentive program that has already yielded positive effects. The Dean has expressed a desire to increase faculty research funding. This is another place where incentives can be valuable. We encourage the College and its Departments to develop methods to reward and incentivize faculty research efforts. Examples could include differential responsibilities (different mixtures of teaching, research, outreach and service for different faculty), a faculty recognition program, and a pre-award grant support. It is common at other universities to allow course releases or lower teaching loads for research-active faculty. This does not appear to be common in CNS but should be considered. A college-level award program (e.g., offering a modest discretionary allocation for a top researcher, a top mentor, a top instructor) can have a number of benefits. It creates a culture that recognizes and encourages excellence. Such a program also provides a set of individuals that can also be nominated for external honors and awards (e.g., society fellowship programs) that will raise the visibility of CNS. Another way to encourage research is to set up a college-level pre-award grant support unit. This has the twin benefits of (1) establishing granting agency specialists (NIH, NSF, DOE, etc.) which is not possible under the existing decentralized model; and (2) allocating staff support to the benefit of research-active faculty.

Recommendation: The Campus should carefully consider the budget model that is used to set College budgets. The budget model should provide additional funds to units that are addressing increasing numbers of students. The budget model should also be more transparent to enable Deans to plan.

Recommendation: The College and Departments should develop programs that reward and incentivize faculty excellence. These can include allowing differential responsibilities for faculty, instituting a college-level faculty recognition program, and setting up a college-level pre-award grant support center.

Increasing Efficiency

The Dean, faculty and staff identified a number of instances in which bureaucratic impediments have made it difficult for them to achieve their goals. Specific examples include difficulties in generating offer letters for faculty, creating and filling new staff positions, and making purchases. This has made it difficult to get staffing levels up to appropriate levels. We recognize that it is not reasonable to expect that a few words from a review team will lead to significant changes in a university bureaucracy. Indeed, we all work at public universities and all of us must deal with bureaucracy. That being said we believe the status quo is having a serious negative impact on morale in the College. Identifying a few areas in which it would be possible to streamline processes and improve efficiency would we believe have a huge impact on morale and productivity.
Recommendation: We recommend that the Dean and Vice Chancellor for Academic Affairs identify a few areas in which campus processes can be improved, set specific goals (e.g., generate faculty offer letters within x days), and then achieve those goals.

College Climate

During our visit we identified a number of instances in which students and faculty identified serious concerns in a number of programs and departments. Examples include concerns about apparent differences in faculty workload, graduate students who identified hostile environments (a special concern in microbiology), and graduate students and undergraduate students who had difficulty getting the classes they need for their programs in a timely manner. It can be difficult for a review team to identify all problem areas during a brief visit. However, we heard enough to suggest that a climate survey of the entire college (students, staff, faculty) would be a valuable exercise. Such surveys have been done elsewhere and with incentives (pizza for the department with the highest student response rate, etc.) can attain good response rates. In examining the previous review team’s report we note that they made a similar suggestion. Thus we suggest serious consideration be given to our recommendation here.

Recommendation: The College of Natural Sciences should carry out a climate survey of students, faculty and staff.

Facilities

Reviewers were given tours of College buildings and facilities. We were impressed by the recent renovation of Edmondson Hall. We noted during our visit that many of the remaining CNS buildings are in need of improvement. Some specific concerns are identified in individual Department reviews. Poor facilities in the sciences can impact the ability to recruit top faculty so it is important that improvements be made. We are pleased to hear that Snyder Hall and Keller Hall are in line to be renovated in the near future. We also note that Bilger and St. John appear to be in need of renovation.

Recommendation: The campus should continue an aggressive campaign of facilities improvement. Snyder Hall and Keller Hall are the highest priorities within CNS.

Leadership

The review team was impressed with the Dean and with the Department Chairs that are now in place. We note that the Dean has encouraged the creation of associate chair positions and believe this is an important way to develop future leaders for the college. Faculty members
note that progress has been made in communication from the Dean to the faculty (primarily through the department chairs) but note that there is room for further improvement.

Assessment

The review team was provided the most recent assessment reports submitted by each undergraduate and graduate program. We also met with the campus assessment team. Our examination found a great deal of variation across the College with some programs among the most enthusiastic adopters of program assessment and continuous improvement (ICS is one notable example) and others apparently not participating at all (the graduate program in mathematics has not been carrying out formal assessments). Assessment is a critical part of regional accreditation and more importantly a way to monitor and improve programs. It is common for faculty to be skeptical of such efforts and thus it is important that College leadership (the Dean and the Department Chairs) help faculty understand the value of assessment.

Recommendation: The Dean and Department Chairs should increase their efforts to educate faculty about the need for assessment and the ways assessment can be used to enhance programs.

Graduate Programs

The review team met with graduate students in each department (though attendance varied considerably), the graduate dean, and faculty in each department. The information that we obtained varied considerably across Departments. The discussion here focuses on points identified in more than one department. We heard appreciation for the recent increase in the minimum graduate stipend but believe more graduate student financial support is needed. The cost of living is high and students receiving graduate stipends should be able to afford a reasonable life. It is especially important that graduate student offers incorporate longer guarantees (as funding allows) and be transparent. Students also noted inequities with RA stipends in similar programs differing widely. (This seems to primarily be a case where ORUs are able to provide higher stipends.). This is natural but can (and apparently does) create morale problems. Additional concerns were raised about graduate curricula with students in more than one program noting that they were unable to get the courses they needed to prepare for the qualifying exam.

Recommendation: Departments need to pay careful attention to the financial offers made to graduate students. Offer letters should be clear and transparent to the students. Stipends should be increased as funds allow and longer guarantees made where possible. In addition, an effort should be made to provide summer opportunities (support, internships, etc.) for students.
**Recommendation:** It is critical that graduate curricula be reviewed regularly to ensure that course offerings are sufficient to meet program requirements. To the extent this is not possible then departments should ensure that students are recruited only into programs/areas where students can expect to make regular progress.

**Undergraduate Education**

The review team met with undergraduate students from each department (though attendance at these sessions varied) and also met with Department faculty. We also met with advising staff and representatives from the undergraduate education office. The review team was extremely impressed by the advising staff that we met. It is obvious that they are dedicated to the students and to helping students succeed. Everyone we spoke to is anxious for the transition from a College of Arts and Sciences level advising program to a CNS advising program to be completed. Students and advisors express frustration at the need to visit multiple offices to complete transactions. It is clear that students would benefit if CNS were able to establish advisers as a single point of contact for students to get information on a wide range of topics (program, financial aid, etc.). Ideally under the new model students will also be able to receive help identifying internships, research experiences and jobs. We were impressed by the work being done in the undergraduate education office, especially the STAR system and the metrics being developed. These will be key to improving graduation rates at UH-M. As a final comment we note that students in some departments expressed a desire for more engagement with faculty.

**Recommendation:** The College should move as quickly as possible to develop a standalone CNS undergraduate advising system. A single point of contact model in which students can get information on a range of topics (curriculum planning, financial aid, etc.) would be ideal. The advising structure should ideally achieve an integrated model for student success that addresses internships, research experiences and jobs as well.
Department of Biology

The Department of Biology currently has 20 faculty members including 7 recent hires in the areas of physiology, evolutionary biology, marine biology and conservation biology. A search is currently underway for 3 additional FTE. The Department Chair is Professor Steven Robinow who is slated to become Associate Dean of the College. He appears to work well with the new Dean and is highly regarded by the department faculty.

The external review team was provided with the following materials about the Department of Biology before the campus visit: self-study report, data workbook, assessment reports dating back to 2008 and survey results from current students. During the campus visit the departmental reviewer, Dean James Hildreth, met with the department chair and with 10 members of the faculty including some of the recent hires. Professor Robinow showed Dean Hildreth the teaching and research laboratories in the newly renovated space in Edmondson Hall. Dean Hildreth was scheduled to meet with undergraduate and graduate students in the department, but no students came to the meetings.

The committee’s overall assessment of the department is that it is on a generally upward trajectory benefitting from strong leadership and the addition of several new outstanding hires. The merger between Biology and Zoology appears to have been successful and has resulted in the department having a large number of undergraduate majors (~1500). The students appear to be well served by the changes that have been made in advising at both the department and college level. The level of extramural support of faculty research is relatively low and faculty efforts to obtain grants could be more robust.

Based on the discussions with faculty and students, the following key issues emerged:

Department Culture:

Professor Robinow has been chair of the department for two years. Dean Hildreth was very impressed by his leadership and understanding of the challenges faced by the college and department. The chair and dean appear to be working well together and as noted above, Professor Robinow has been chosen by the dean to serve as associate dean of the college. The department has two associate chairs, one for research and graduate education and a second for undergraduate education. The faculty members in the Department of Biology appear to be very supportive of both the dean and their chair. The departmental culture appears to be collegial and the new hires expressed general satisfaction with their overall experience in CNS. The faculty appeared less confident in the university and its ability to provide support of their efforts both in teaching and research. The low staffing levels of the department and what was referred to as “stifling bureaucracy” are issues that appear to dampen what is otherwise high morale among this group.

Recommendation: The department is commended on the collegial and friendly atmosphere for faculty. The failure of any students, undergraduate or graduate, to attend the meetings
scheduled with the review team suggests that students may not be actively engaged by faculty members beyond instruction. It is recommended that the department develop specific activities to address this issue. These could include faculty-student lunches, freshmen seminars, faculty-advised clubs and social events.

**Research and Graduate Education**

Research in the Biology department is focused on biological evolution to take advantage of Hawaii as a site for such studies that provides access to unique marine and terrestrial organisms and systems. Research topics span a broad range from fundamental research to applied fields, such as conservation and environmental monitoring. The faculty members in the Biology department are modestly productive as data in the self-study reveal 1.78 publication per faculty per year over the last review period. During the review period a total of 75 research proposals were submitted requesting a total of $17 million. The success rate was reported to be 16% for a total of $2.8 million of actual research support. This works out to a very modest level of annual support of approximately $30,000 to $50,000 per year per faculty member. There are a few faculty members who account for a substantial fraction of the total departmental extramural support.

The faculty expressed considerable frustration over the lack of pre-award support and felt that this was an issue both at the level of the department and the college. There were also concerns regarding the post-award processes especially related to processing and reconciling orders and requests related to research. Many felt that these issues were related to staffing levels and competence.

The department offers graduate degrees in Marine Biology (MS, PhD) and Zoology (MS, PhD) and there are 95 graduate students enrolled in these programs. Eighteen percent of PhD students are reported to drop or graduate in a different program. This figure is less than 7% for the MS students. Most of the students are supported by a combination of teaching and graduate research assistantships. Since no graduate students attended the scheduled meeting with Dean Hildreth it is not possible to assess their perspectives on graduate training in the department.

**Recommendation:** The department has had an infusion of several outstanding new hires that appear to be focused on ecological and evolutionary biology. Four additional hires are expected. Thus the department is well positioned to start thinking about multi-PI funding opportunities. A strategic plan should be developed that focuses on unique opportunities and strength in evolutionary biology, ecology and marine biology. Collaboration in these areas with the other life sciences departments in CNS should be a high priority. Steps should be taken at both the departmental and college level to facilitate grant submissions by the faculty.

**Recommendation:** While no graduate students met with Dean Hildreth, it is clear that issues raised by students in other programs very likely apply to graduate students in the Biology Department as well. These should be addressed at both the college and departmental level and
include low stipend levels, low number of graduate research assistantships, unavailability of
courses required for passing qualifying exams and absence of a defined curriculum.

**Undergraduate Education**

As a result of the merger with Zoology, the Biology department serves a very large number of
undergraduates (1400). The student to faculty ratio is 70:1 and the faculty members teach
approximately 7900 SSH, more than half of which is accounted for by non-majors. The
department is taking full advantage of newly renovated teaching laboratories but faculty note
that classroom lecture space is becoming somewhat of a challenge. The department has taken
a number of steps to address the challenges and concerns identified in the last review. These
steps include simplifying the curriculum and making it easier for students to progress, increased
offerings of gateway courses and coordination of course scheduling with other departments.
The department has taken steps to move away from standard lecture style teaching to a more
active-learning format. Some of the Biology faculty members are taking advantage of a new
state-of-the-art classroom, Webster 101, funded by the university and designed for active and
interactive learning. Given the large student enrollment, the Department of Biology is
committed to offering more teaching labs per course, and has expanded offerings of the
introductory courses for Biology BA and BS majors, to fall, spring and summer semesters. The
department has initiated an effort to map the entire curriculum as a first step to undertake a
comprehensive assessment of the undergraduate programs. Professor Robinow informed Dean
Hildreth of plans to hire a lecturer with pedagogy expertise who will assist faculty in innovating
the Biology curriculum. This is very good idea and should pay dividends for the students and
faculty in the department.

The department recently hired a faculty specialist charged with developing and overseeing
undergraduate student advising and assessment. This is a very important step given the large
number of majors and the significant challenges associated with advising such a large number
of students. The department has made advising mandatory for all freshmen, sophomores and
transfer students. This is an excellent step toward facilitating student success.

As noted above, no Biology undergraduate students attended the meeting scheduled with Dean
Hildreth. It is therefore difficult to assess their perspectives on the undergraduate experience
in the department.

**Recommendation:** The department is commended for its meaningful and significant responses
to the concerns raised in the previous review. The committee recommends that the
department continue its effort to revise and simplify the curriculum with the purpose of
facilitating improvements in four year graduation rates and preparing student for diverse
aspirations.

**Recommendation:** The failure of undergraduate students to attend the meeting scheduled with
Dean Hildreth appears to reflect a lack of engagement between faculty and students in the
department. The department should consider ways to correct this such as faculty-student luncheons, faculty-advised clubs, social events and freshmen seminars.

Collaboration

The department appears to have limited connections to other units through teaching or research. Biology cooperates with the Department of Chemistry in its new Biochemistry major and this is a great example of a successful collaboration. The Biology department is well positioned for research collaborations with faculty in engineering, math and computer science, the Pacific Biosciences Research Center, at the Hawaii Institute of Marine Biology and at the Kewalo Marine Laboratory.

Recommendation: The department should actively seek opportunities for research collaborations with other departments in CNS and with faculty members in other units in the university. Such collaborations could emphasize projects related to grand challenges including the environment, health and food. In addition to facilitating multi-investigator grants, such collaborations would contribute to a greatly improved training environment for students and help to attract top graduate students and outstanding faculty.

Diversity

The diversity of the department, especially the gender balance, could be improved. It is notable that 2 of the 7 recent hires are women.

Recommendation: The department should develop a plan for recruiting and retaining a diverse faculty. Possible specific approaches include implicit bias training for the search committee members as well as ensuring broad and diverse committee membership. Every effort should be made to identify diverse applicant pools and to avoid narrowly focused searches when possible.
Department of Botany

The Botany department currently has 16 faculty members including 3 recently recruited assistant professors. A search is currently underway for a senior endowed professor (one of two in CNS). The department is chaired by Professor Tom Ranker. The expertise and focus of the department is on the ecology and evolution of plants, algae and fungi with a particular focus on the unique Hawaiian ecosystem.

The external review team was provided with the following materials about the Department of Botany prior to the campus visit: self-study report and appendices, data workbook, assessment reports dating back to 2008 and survey results from current students. During the campus visit the departmental reviewer, Dean James Hildreth, met with the department chair and with 8 members of the faculty including most of the recent hires. Professor Ranker showed Dean Hildreth the research laboratories, examples of teaching space and greenhouse facilities at St John Plant Sciences Building. Dean Hildreth met with 2 graduate students and was scheduled to meet with undergraduate students in the department, but no undergraduate students came to the meetings.

The committee’s overall assessment of the department is that it is on a generally upward trajectory and it has benefitted from strong leadership and the addition of several new outstanding hires. The level of extramural support of faculty research is relatively low and faculty efforts to obtain grants could be improved. The department provides leadership for the Pacific Cooperative Studies Unit (PCSU) but it is not clear how the department has leveraged this resource for scholarship within the college. The graduate and undergraduate programs are small but compare favorably in size to similar programs at peer institutions.

Based on the discussions with faculty and students, the following key issues emerged:

Department Culture:

Dean Hildreth’s meetings with the department chair and the faculty in Botany reveal a culture of collegiality and cohesiveness. The faculty members appear to respect and appreciate the leadership of Dr. Ranker who appears to be working very well with Dean Ditto. The leadership of the department has been enhanced by the naming of associate chairs for administration and for graduate studies. The morale of the department appears to be relatively high and the faculty members appear to think very highly of Dean Ditto. However, the faculty members in botany expressed a feeling of apathy toward the upper administration and feel that the leaders either do not understand or care about the challenges they face. Further, there is a perception that pre-audits, overly detailed justifications for purchases and unwieldy bureaucracy result from an environment of mistrust. A number of faculty members referenced the lack of institutional support for families as a significant factor that will impact recruitment, especially of junior faculty, in the future. Senior members of the Botany faculty lamented the lack of recognition for faculty achievements, lack of faculty input in major decisions impacting the department and college and a lack of communication between faculty and college leadership.
The faculty are aware that the facilities are in need of updating and renovation but appear content to make the best of the existing conditions until resources are available.

**Recommendation:** The Department of Botany is commended for its collegiality and the cohesiveness of its faculty members. The department chair is encouraged to hold regular faculty meetings to communicate with the faculty members regarding important departmental and college issues and to insure that college level decisions and issues are communicated effectively to Botany faculty members.

**Recommendation:** The faculty members are encouraged to reach out to faculty members of other departments in CNS to engage in more collaborative teaching and research activities.

**Research and Graduate Education**

The research productivity of the department’s faculty is modest to good as measured by publications and grants. According to the self-assessment document the Botany faculty published a total of 178 peer-reviewed contributions over the 5-year period from 2008-2012, which works out to an average of 2.6 publications per faculty per year. Review of the faculty CVs show that their papers appear in mid-tier journals with some work published in top journals including *Science*. When considered separate from the grants and contracts of PCSU, a total of 39 grants and contracts were awarded to faculty in the Botany department totaling $2,588,963 for the 5-year period since the last review. This works out to a modest figure of $37,521 per faculty per year. This is low in comparison to other life sciences departments in the college and also to Botany departments in comparison institutions. The type of research performed by faculty in the Botany department, many are field ecologists, contributes to their low level of grant support which comes from the state, military and other non-federal sources. However, these individuals could compete for federal funding from NSF and other federal agencies. It is a serious concern that neither total funding nor submitted applications from Botany faculty has changed very much over the last five years. The faculty in Botany as in other CNS departments report that pre-award support is very poor in the college and attribute this in part to low staffing levels. They also reference challenges related to expending grant resources (cumbersome ordering processes, difficulty generating P.O.s, etc).

The department has its own organized research unit established forty years ago, the Pacific Cooperative Studies Units (PCSU). The PCSU was awarded a total of 563 contracts during that time, for a total of $67,717,340. According to the self-assessment report, the PCSU conducts a wide range of activities focused on natural and cultural resources in Hawaii and the Pacific. Its efforts, usually in collaboration with state, federal, and private agencies and organizations, include basic research, on-the-ground adaptive management, technical assistance, and education. Its staff of 349 includes 9 Ph.D.s. It serves as a conduit for external funds for Botany and other UH faculty, supports graduate student projects, and is a significant employer of Botany students once they receive their degrees. As noted above two Botany faculty members (Professors Duffy and Morden) serve in leadership roles for PCSU and devote substantial proportions of their time to those duties. The PCSU appears to be a great vehicle for
community outreach and extension education but it is not clear how the considerable research resources of PCSU are leveraged by the department for instruction or scholarship within the college.

The department offers graduate MS and PhD degrees in Botany in a relatively small program that currently has 35 students enrolled. Between 2008 and 2012, the program graduated an average of 9 MS students and 5 PhD students per year. During that same period 25% of students studying for the PhD either left the program or graduated in a different field. The program has no defined curriculum as is the case for graduate programs in other life science CNS departments. Funding for graduate students is a significant challenge; only 9 teaching assistantships are available to the program and since faculty grants are small and few, research assistantships are not widely available to students many of whom compete for their own grants. The stipends are low as noted elsewhere and this is a significant problem for the program. The lack of professional development activities and support for the students is also a problem.

**Recommendation:** The faculty in the Botany department should be encouraged to submit proposals for funding to federal agencies, especially the NSF. The department and college should take steps to improve pre- and post-award grant support for faculty.

**Recommendation:** The challenges related to graduate education in the Botany department are similar to those in other CNS departments and thus warrant attention at the college level (low stipends, low numbers of teaching assistantships). The department should take steps to create a defined curriculum and ensure that appropriate courses relevant to qualifying exams are available to students. The department should work with other units in CNS to create professional development opportunities for graduate students including travel awards for research meetings and conferences.

**Undergraduate Education**

The Botany department offers three undergraduate majors, Botany (BA/BS) and Ethnobotany (BS) that between them currently enroll 51 students across all years. The courses taught by the Botany faculty in total approximately 900 SSH of which 70-75% represent courses taken by non-majors. Since the previous program review, the department has worked to develop program assessment plans and tools for the three undergraduate degrees. Student learning outcomes were devised and then applied to existing courses resulting in a curriculum map for the three undergraduate degrees. This process resulted in revised courses, elimination of courses and creation of some new courses. These steps were taken in the context of what was felt to be “state of the art” knowledge in botanical disciplines and also the perceived needs of the work force relative to botanical expertise. These changes were approved and implemented in spring semester of 2012 and thus it is too early to know how effective they will be for improving student outcomes. Tools for assessing success of achieving learning objectives are being developed.
Students In the Botany majors receive advising through the Biology department with support from the Dean’s office. This arrangement, along with advising from faculty in the department, appears to be serving the needs of Botany undergraduate students adequately.

**Recommendation:** The department is commended on its efforts to map the curriculum of the majors and to develop tools to measure effectiveness. The changes made in course offerings and sequencing to enhance 4-yr graduation rates are also applauded. The committee recommends that the department continue its efforts to innovate the curriculum, especially focusing on incorporating the research of the faculty into the student experience. The department should work to increase the exposure of undergraduates to research and take steps to increase opportunities for internships.

**Recommendation:** The lack of participation of students in the pre-arranged meetings with the review team suggests that the faculty may not be engaged with the students. The department should consider ways to correct this such as faculty-student luncheons, faculty-advised clubs, social events and freshmen seminars.

**Collaboration**

The Botany department appears to have limited connections to other units through teaching or research. Botany faculty members participate in teaching of some gateway courses along with faculty from other CNS departments. The Botany department is well positioned to interact with the other CNS departments in research studies that exploit the unique ecosystem represented by Hawaii.

**Recommendation:** The Botany department should actively seek opportunities for research collaborations with other departments in CNS, especially the other life sciences departments. As noted above, a specific goal should be obtaining multi-investigator awards that take advantage of the strengths of the newly recruited and existing faculty, especially in the areas of evolutionary and conservation biology. Inter-departmental and inter-college collaborations would bolster the stature of the programs in CNS help to attract top graduate students and fellows and outstanding faculty.

**Diversity**

The diversity of the Botany department appears to be good both with respect to gender and ethnic and racial minorities.

**Recommendation:** The department is commended on its diversity and is encouraged to maintain and expand its diversity as it grows through future hires. To that end the committee encourages the department to develop a plan for recruiting and retaining a diverse faculty. Possible specific approaches include implicit bias training for the search committee members as
well as ensuring broad and diverse committee membership. Every effort should be made to identify diverse applicant pools and to avoid narrowly focused searches when possible.
The department has 10 tenured and tenure-track faculty members (one hired very recently). Only one faculty member (Kristin Kumashiro, chair of the department) is a woman. The department has plans to grow faculty FTE over the next five years, from 10 to 20. Hiring is planned to be across the sub-disciplines, but with some priority given to biochemistry. Faculty expertise is distributed across the sub-disciplines of biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.

The external review team was provided with the following material about the Department of Chemistry prior to the campus visit: a self-study report, faculty curriculum vitae, a data workbook, assessment reports dating back to 2008, and the results of graduate and undergraduate student surveys. During the visit the departmental reviewer, Dean Jeffrey Roberts, met with the Chair of Chemistry (Prof. Kristin Kumashiro), with members of the Chemistry faculty (all but one tenured / tenure-track faculty member were present), and with 2 graduate students from the department. Prof. Kumashiro showed Dean Roberts some of the teaching and research labs in department, and Dr. Walter Niemczura, the department’s facilities manager, took Dean Roberts on a tour of the NMR facilities. During the site review, a graduate student who had been unable to attend the graduate student meeting wrote to Dean Roberts about certain issues. Dean Roberts was scheduled to meet with undergraduate students in the department, but no students came to that meeting.

The committee’s overall assessment of the Department of Chemistry is that it appears to be on a generally upward slope, driven especially by strong department leadership and an influx in hiring resources. The committee encourages the department to be more careful and intentional about community building and long-range planning, especially as the large number of faculty hires is creating a rare opportunity for the department to think about and plan for its future. The undergraduate program would benefit from a stronger emphasis on all aspects of undergraduate student success, to include curricular innovation, the creation of more professional development opportunities including undergraduate research, and more efforts at community building. The graduate program would similarly benefit from increased attention to certain areas, including the nature and level of graduate support, the appropriateness of the course offerings for admitted students, and the availability of professional development opportunities.

Based upon the discussions with students, faculty and staff, the following key issues arose:

**Department Culture**

Prof. Kumashiro is completing her second year as chair of the department. Dean Roberts was generally impressed by her leadership and by the extent to which she has worked to implement much needed changes in curriculum, and to create a more harmonious department culture. The dean and department chair appear to work well together. Prof. Kumashiro recruited an
associate chair, Associate Professor Philip Williams. Except for Profs. Kumashiro and Williams, the department’s leadership ranks appear to be thin.

Two graduate students met with Dean Roberts in the time set aside for that purpose, and one student provided written comments. Some concerns were expressed about the level of graduate support. Students also reported that they felt a lack of community within the department, with limited and sometimes hostile communication between different research groups. The inability of students to provide specific answers to questions meant to address the issue of community (e.g., “Are their clubs for graduate students?”, “Where have recent graduate students found jobs?”, “How many students were in this year’s entering class?”) seemed to confirm what the students reported. Serious concerns were reported by more than one student about the small number of graduate-level courses offered in chemistry, and especially about the unfairness of qualifying exams that test knowledge on material for which courses are not offered.

**Recommendation:** Assess the departmental climate as it impacts faculty, staff, and students in the Department of Chemistry. (Note that this can be done as part of the college-level climate survey recommended in the college review.) Dean Roberts learned that some departmental stakeholders perceive a chilly and hostile climate. The review team could not confirm that this is the case, but it was concerned enough to believe that a careful assessment would be valuable. If serious climate issues are uncovered, the Vice Chancellor should consider hiring an outside facilitator to address the most important issues.

**Research and Graduate Education**

The department has been careful to recruit exceptionally talented faculty members to Hawaii; the overall record of faculty accomplishment before coming to Hawaii is generally consistent with what is seen at top-ranked departments. The department’s standard 2:1 teaching load is in line with the load at comparably ranked graduate degree-granting departments. Publication rates are modest. From the department’s self-study, the mode of the 6-year total publication number per faculty member is 6.12, or just over one publication per year. The self-study reported external funding of $8.08 M between 2008 and 2013. (The self-study does not indicate whether this figure refers to awards or expenditures.) This corresponds to an average of $168,000 in annual support per funded faculty member, but well over half of the funding is associated with grants awarded to two faculty members.

Faculty expressed concerns with the ability of the department and university to support high-level research. Principle issues included: low TA stipends and their impact on the ability to recruit graduate students, the limited capacity of the department to offer graduate courses, the poor state of infrastructure in the department, and the bureaucratic challenges associated with accomplishing routine faculty work (proposal submission, procurement, and so on).

The graduate program in the Department of Chemistry is of modest size, with 39 currently enrolled graduate students, approximately two-thirds of whom are in the Ph.D. program. From
the reported “quantitative indicators,” 44 of 104 students who had enrolled in a chemistry graduate program between 2003 and 2013 left the university without a degree, and 14 graduated from programs in other departments. The report indicates that 14 M.S. degrees and 13 Ph.D. degrees were awarded by the department from 2007-2008 through 2012-2013. Graduate student support appears to be largely in the form of teaching assistantships during the academic year, with a reasonable number of research assistantships available to students in the summer.

**Recommendation:** Even at full build-out, the department will still be relatively small, making it extremely important to encourage the growth of scholarly communities that extend beyond the sub-disciplines. The department might evaluate the usefulness of the current, highly focused hiring strategy.

**Recommendation:** The department should also reconsider current policies and practices regarding the graduate program. In addition to the college-wide issue of inadequate financial support, two areas are of particular concern. First, even senior graduate students appear to be generally supported as teaching assistants during the academic year; the department should consider whether faculty with grant funding should be encouraged and perhaps incentivized to provide academic year research assistantships. Second, the department should acknowledge its responsibility to ensure that every admitted graduate student has access to an appropriate set of courses. If students in a certain sub-discipline won’t have access to necessary courses, especially including those that provide essential preparation for the qualifying examinations, then the department should either modify its requirements or suspend admissions into the program until requirements can be met.

**Undergraduate Education**

As is the case at almost any public university, the Department of Chemistry plays a critical service teaching role. Lower division instruction has increased markedly over the past several years, from 5,386 SSH in 2007-08 to 7,759 in 2012-13. Over 95% of lower division instruction is provided in courses that include a significant majority of non-majors. The number of majors has also increased from 146 to 192 over the same period. The number of majors is consistent with what would be found at peer institutions. The department has modernized certain aspects of the lower- and upper-division curricula, and it has streamlined some of processes for course registration and transfer credit evaluation. The department is to be applauded for introducing new B.A. and B.S. programs in Biochemistry, which appears to be responsible for roughly half of the increased number of majors. Because no undergraduate students attended the scheduled meeting, Dean Roberts was unable to ask students about their perspectives on the undergraduate chemistry program.

During Dean Roberts’ meeting with chemistry faculty, concerns were expressed about the perceived low level of preparation of students enrolled in foundational chemistry courses. The faculty as a group did not appear to be interested in the subject of curricular innovation as a tool for improving student success.
**Recommendation:** The department should work with appropriate units on campus to develop strategies for increasing student success in the gateway courses. Such strategies need not result in “dumbing down” of the curriculum. Moreover, as the university prepares to revisit its budget model, and to move away from an incremental model for resource allocation, the department should be even more aggressive about recruiting undergraduate majors.

**Recommendation:** The failure of any undergraduate to come to the meeting that was set aside for that purpose was taken by Dean Roberts as a sign that students are not engaged in the life of the department. The department should consider simple strategies (faculty-advised clubs, social events, journal groups, etc.) that might bring undergraduates and faculty together for informal interactions.

**Collaboration**

Faculty were pleased by Dean Ditto’s efforts to expand faculty recruiting. Departmental culture appears to be somewhat insular, and there are few apparent faculty collaborations that involve other units on campus with some notable exceptions (for instance, with the Cancer Center).

**Recommendation:** Rethink the current departmentally-focused hiring plan, and consider whether an emphasis on broad “grand challenge” areas involving multiple departments and colleges might be a better route to success than standard disciplinary hiring. There are unrealized opportunities for collaboration within and outside the department. The ability to compete for large multi-investigator grants, to recruit top graduate students, and to grow the department’s stature will require the development of a more collaborative and entrepreneurial faculty culture.

**Diversity**

The fraction of women tenured/tenure-track faculty members in the department (1 of 10) considerably lags what is generally found in peer and aspirational peer departments. The committee recognizes the challenges in recruiting women into science departments, and it acknowledges that the circumstances in chemistry are partly a result of bad luck, for instance the decision of a faculty member to return to the mainland where opportunities for her spouse were greater. That said, the department appears to do little proactively in this regard.

**Recommendation:** Develop a comprehensive strategy for recruiting and retaining a more diverse faculty in the Department of Chemistry. Possible approaches might include additional search committee training and broader search committee membership, avoiding whenever possible narrowly focused searches, and more vigorous efforts to identify potential applicant pools.
Department of Information and Computer Sciences

The Department of Information and Computer Sciences contains relatively distinct programs in computer science, and in library and information science, with those programs housed in separate spaces about five minutes apart. Of the 31 tenure-line faculty, 23.5 are in CS and 7.5 in LIS. The total number of students (undergraduate and graduate) has held relatively steady in recent years at about 450-470. The total number of undergraduate majors has held steady at just under 320 with the BA in Information and Computer Sciences gradually rising from 53 to 96 majors in the last 6 years and the BS in Computer Science dropping from 286 to 221 majors. The Master of Library and Information Science has held steady in the 90-100 students range, while the enrollments in the MS and PhD programs in Computer Science have been in the ranges of roughly 20-30 and 25-30 students, respectively. Total research grant expenditure levels also have held rather steady at about or slightly over $1M, although they may be about to rise. From the set of CVs that were provided for most of the faculty in the self-study, it appears that the faculty maintains a good level of research activity and publication.

During the campus visit the departmental reviewer, Dean Robert Schnabel, conducted a review that included a meeting with department chair David Chin; a meeting with ICS faculty attended by approximately 15 faculty; a meeting with LIS (library and information sciences) faculty attended by most (6) of the program faculty; a meeting with graduate students attended by four LIS students and one CS (computer science) student; a meeting with eight undergraduate CS students; tours of the ICS spaces on the 3rd floor of POST and in Keller Hall, and the LIS area in Hamilton Library; and a discussion with the ICS undergraduate advisor as part of a broader advising meeting with the entire review team.

Based upon the discussions with students, faculty and staff, the following key issues arose:

Transformation from a Department to a School within CNS

The main strategic issue that the faculty raised is a proposal to have the department become a school, likely headed by a director, within the College of Natural Sciences. There appears to be broad although not unanimous faculty interest in pursuing this step. The interest comes from the perceived advantages in both internal and external recognition that would result from becoming one of the growing national and international set of “iSchools”, and from the ability of a school structure to recognize that the ICS department really is a set of two departments (CS and LIS) and could very naturally contain a third, information science or informatics department. There did not appear yet to be a well-articulated rationale for how the move to a school would bolster the education and research excellence of the unit.

Recommendation: Transforming to a School of Information and Computer Science within CNS is a potentially beneficial step for the department, college and university, and should be considered. This should be done, however, in the context of constructing a vision for the unit which articulates how a transformation to a school could provide new opportunities for excellence in education and research. For example, the school structure could enhance the

21
opportunity to construct a new major (or a version of the existing BA) in informatics or a related name, to construct new multidisciplinary research and education programs in data science or other areas, and to interact more extensively with other units at UH Manoa. A proposal to become a school should be predicated on identifying such opportunities, while also acknowledging the structural and visibility advantages that a school could provide.

Research and Graduate Education

Many faculty members appear to be maintaining a good level of research productivity. In spite of this, external research funding levels are quite low for an information and computer science unit of this size. Student and faculty comments made it clear that there is a need for more graduate research assistant support, which requires more external research funding. This funding would bolster the experiences of the PhD students and enhance the research productivity of the faculty. Related to this, discussions also indicated that the Department has not extensively utilized a strategy of selecting specific areas for emphasis in research and graduate education, and giving those areas special attention in hiring and resource allocation. Such a strategy is at the heart of the strategy for excellence in many computer science departments. (The self-study report alludes to building around the areas of two recent hires but this was not reinforced strongly during the visit.) LIS graduate students also commented that there is not much opportunity for research with LIS faculty, and that LIS should consider devoting attention to native Hawaiian issues.

Recommendation: The department should consider designating 2-3 areas where it aims to have particular strength in research and graduate education, based around a cluster of research-active faculty in each area. As needed, it should target future hires to build these clusters. The recent hires in security and visualization make these areas attractive candidates for excellence, and there is some current concentration of faculty in human-computer interaction / artificial intelligence. The department will want to project its national / international leadership in selected research areas on its website and other materials. The opportunity for LIS to develop a specialization in native Hawaiian areas may be attractive as well.

Recommendation: The department should increase its emphasis upon faculty attracting external funding that supports research assistants. It should consider providing incentives for faculty who are successful in this regard, such as reducing teaching loads for faculty who support a number of research assistants on external grant funding. The possibility of a reduced teaching load will be necessary to compete successfully in hiring excellent research-oriented faculty. To compensate for the loss of teaching, the department may want to consider a small increase in the use of lecturers for undergraduate education.
Undergraduate Education

The discussion with computer science undergraduate students showed strong agreement on several points. The students were pleased with the knowledge and accessibility of the faculty and teaching assistants, and had particularly high praise for the student advisor. They voiced several significant concerns, including: the curriculum provides little real-world experience, such as with large projects and teamwork; there is no capstone project class; there is little support from the department for finding internships and in career advising; class schedules only are available one semester in advance, which makes it difficult to efficiently plan progress through the major.

Recommendation: The department needs to find a way to provide more support to students in finding internships, understanding computing careers, and finding jobs after graduation. It may want to explore ways to do this in partnership with other units, such as within CNS, or by partnering with Engineering.

Recommendation: The department also should examine the software project portion of its curriculum, including looking at practices in other leading CS departments. A capstone course is a common way to address this aspect of the computer science curriculum. Enhancing this area of the curriculum may require the use of lecturer or adjunct faculty who are well experienced in software projects and can devote the time that software project course require. The department also should assure that course schedules are available at least a full year in advance so that students can plan effectively.

Diversity

Gender diversity is a challenge in all US computer science departments. Discussions with the ICS department chair showed a commendable desire to increase the quantity and experiences of female computer science students, and an interest in finding effective ways to do this. Currently, the department does little proactively in this regard.

Recommendation: The department should construct and implement a diversity strategy. There is considerable national experience to draw upon in doing so. Elements of a successful strategy generally include: advising at the department, school and university level that makes students aware of the breadth of computing education and careers; introductory courses that provide a supportive environment including teamwork and give encouragement to promising students to pursue the major; student support organizations such as Women in Computing that provide community to students who desire it; faculty and staff support for students throughout their time in the program including regarding internships and careers.
Facilities

Department facilities generally appeared to be adequate. The separation between computer science and LIS (POST and Hamilton Library) as well as the location of some of CS in Keller is unfortunate and hinders collaboration, but there is little likelihood of improving this situation soon. The only other significant issue that arose is that there is little community space for CS undergraduate and graduate students.

**Recommendation:** ICS should consider creative ways to provide some community space for CS students. It may be possible to carve out some community space in POST. Another possibility could be to allow CS students (possibly just graduate students) to use the generous student community space that is provided for LIS students in Hamilton Library.

Collaboration

The discussions with faculty and students made little mention of collaboration with other units where interaction would seem natural, ranging from engineering to sciences to communication. In addition, LIS students felt that the connection between LIS and CS was very loose.

**Recommendation:** As the department constructs its vision and strategies for many of the topics mentioned above – such as featured areas for research and graduate education, increased research funding, provision of enhanced career and internship advising, attention to gender diversity – collaboration with other units at UH Manoa can play an important role. The department should think about how interaction with units including engineering and others can help it more successfully and effectively achieve its goals. It also should assure that it takes full advantage of the fact that CS and LIS are part of one department, and utilize this fully in both education and research.
Department of Mathematics

The Department of Mathematics offers undergraduate (BA, BS) and graduate (MS, PhD) instruction, emphasizes research in both pure and applied mathematics, and carries out extensive outreach (especially for K-12 math education). The departmental reviewer, Dean Hal Stern, reviewed the Department’s self-study and associated material, met with the Department Chair Erik Guentner, met with a group of faculty (about 7 in all), and met with a group of college staff (including representation from Math). Additional meetings were scheduled for graduate students and undergraduate students, however this led to a conversation with only one undergraduate student and one graduate student from another department (who serves as a math TA). The relatively low attendance at the faculty meeting (compared to what happened in other departments) and the non-attendance at student meetings (the one undergraduate stumbled upon the reviewer by accident) was disappointing. It is hard to know whether this reflects student unhappiness or apathy, or a lack of commitment by the Department to involve the students. In the future it is important that greater effort go into arranging attendance at the meetings.

In general, the department appears to be moving in a good direction. Chair Guentner is extremely thorough in his consideration of department issues and approaches to address them. The faculty members appear to be a collegial group and are supportive of the Chair.

The findings and recommendations below are based on information obtained from the self-study and the meetings.

Faculty

The Department of Mathematics has 29 FTE with four vacant (and being recruited) during the 2013-14 academic year. The review team reviewed CVs of the faculty and summaries of faculty productivity over the last five years. The faculty members in the department have an unusual seniority distribution – 11 members of the current faculty have been at UH for more than 30 years and at the other extreme 9 faculty members have been at UH for fewer than 10 years. The existing vacancies and unusual age distribution have several important consequences. First, the Department is likely to have between 3 and 7 retirements to replace next year in addition to any unfilled recruitments this year. This puts a heavy load on the Department and means that the Department will likely be recruiting multiple faculty members for the next several years. Second, as pointed out in the Department self-study the research profiles of the more recent hires look quite different than those for other members of the faculty. The recent hires average more than 10 refereed publications over the last 5 years; the others average less than half this amount. This means that attention may be required to insure that research active faculty members are not overburdened. Finally, the Department’s teaching workload has increased dramatically over the last five years (about a 30% increase in student-semester hours). In concert with the vacant faculty lines this has led to a greater reliance on lecturers.
The Department of Mathematics is likely to have a difficult time filling its many vacant positions and will therefore be challenged to reward productive faculty and fulfill its teaching obligations.

**Recommendation:** The Department of Mathematics should receive permission to recruit aggressively in view of the anticipated retirements. One strategy is to allow them to make more offers than there are vacancies during a recruiting cycle. Given that not all offers are successful this will increase the probability of a successful recruiting season. In the unlikely event that too many offers are accepted this will merely decrease the number of recruitments in the subsequent year.

**Recommendation:** The Department should think strategically about how to approach the large number of current and expected recruitments. Ideally the plan should identify areas in which the Department might like to establish or enhance its reputation. The plan should also integrate collaborations with other departments in the college and relevant units outside CNS.

**Recommendation:** The Department should develop an approach that incorporates differential workload to reward and incentivize faculty achievements in research. The appropriate teaching workload for research active faculty in peer (and aspirational peer) departments is 3 semester courses per year. Currently the workload for all faculty members is 4 semester courses per year.

**Recommendation:** The Department will be challenged to meet its teaching obligation and to insure high quality instruction while dealing with faculty vacancies and reducing the teaching load of research active faculty. This can be addressed if the Department explores the use of teaching specialist faculty (these have a variety of titles in other institutions). Such faculty can contribute a great deal to meeting increasing student demand for courses and to enhancing the quality of instruction.

**Recommendation:** The review team applauds the Dean’s commitment to initiate a post-doc program in the Department. Such individuals can enhance the research reputation of the Department. We recommend that the build out to three post-docs continue.

**Graduate Program**

As describe above no mathematics graduate students came to the scheduled session with the reviewer. Dean Stern discussed the program with the Department Chair and with the faculty. The program has doubled in size in the last five years. For the most part faculty are pleased with the graduate program. They note that the Department is working to redesign the graduate program to be more inclusive of applied mathematics. Faculty also mentioned being appreciative of the recent establishment of a minimum graduate stipend. One concern that was voiced was about the quality of the applicant pool. This should be monitored carefully.
Undergraduate Program

Only one undergraduate student attended the scheduled session with the department reviewer (and that student arrived accidently and was not aware of the session). This student was extremely positive about his experience in the Department. But this is just one student and the Department should work to get more information about student attitudes (perhaps via a college level climate survey as recommended in the college review).

Both the one student who attended and the faculty give the impression of a very positive environment. For one example, the Department has biweekly meetings on general interest topics that are open to faculty, graduate students and undergraduates.

Diversity

The faculty is predominantly male with only three female faculty members. This is below the proportion of females in the national pool of mathematics doctoral recipients. We note that the three female faculty members have all been hired in the last 12 years which is a positive trend and encourage continued attention to the diversity of the faculty.

Recommendation: Develop a strategy for recruiting and retaining a diverse faculty. Possible approaches include search committee training (e.g., about implicit biases), broader search committee membership, avoiding narrowly focused searches, and making an effort to identify the broadest possible applicant pool.

Outreach

The Department’s NSF funded SUPER-M outreach program to enhance K-12 mathematics education is extremely impressive and a credit to the Department.

Staff

Staff in the department received universal praise from the faculty and few students with whom the department reviewer interacted. All note however that the Department is short-handed.

Recommendation: The Department of Mathematics needs to quickly fill the staff opening in the Department. Any support that can be provided by CNS administration to enable rapid completion of this recruitment would be welcome.
Facilities

The Department of Mathematics is primarily located in Keller with several offices in neighboring buildings. A tour of the facilities indicates that Keller is in very poor shape. There are several concerns that are impacting the educational program. As the building’s climate is controlled through ventilation there are open windows and doors while classes are meeting. This makes for a noisy environment with a great deal of ambient noise and occasional loud disturbances from outside. In addition none of the rooms have projectors. Instructors must bring projectors from the fourth floor storage area to classrooms as needed. This is especially problematic when the projectors are needed on the third floor. The VCAA and Dean both indicate that Keller is likely to be renovated in the near future.

**Recommendation:** Renovation of Keller Hall should be a high priority for the College of Natural Sciences and the campus.
Department of Microbiology

The department currently has 7 tenured/tenure track faculty and most of the department faculty have been at the University of Hawaii for quite some time. This includes the current chair Dr. Maqsudul Alam. A plan has been approved for 4 additional FTE to be hired now with the understanding that at least two more will be hired over the next few years. There are currently no female faculty members on the department roster. The expertise of the department spans general and applied microbiology, immunology and molecular and cellular biology.

Prior to the visit the committee was provided the following materials about the Department of Microbiology: a self-study report, data workbook, annual assessment reports spanning 2008 to 2012 and student survey results from current students. During the visit the department reviewer, Dean James Hildreth, met with the department chair, with two members of the faculty (no others attended) and with a group of MS and PhD students. Chair Alam showed Dean Hildreth some of the facilities in Snyder Hall including the Genome Center. Dean Hildreth was scheduled to meet with undergraduate microbiology majors but only one student came to the meeting.

The committee’s overall assessment of the Department of Microbiology is that it appears to be on an upward trajectory and has a strong leader who appears to be working well with the new dean. But there are some concerns that need to be addressed as noted below. The department would benefit from an influx of new hires to modernize the research and provide innovation for the curriculum. There is also evidence of internal conflict among the faculty which in a small department can hamper success and create a challenging climate for students and staff. The graduate program could be greatly enhanced by revising the curriculum to include a set of required courses and expanding the range of elective courses available to the students. The level of support for graduate students is a serious concern as is the limited availability of professional development opportunities.

Based on the discussions with faculty and students, the following key issues emerged:

Department Culture

Professor Alam impressed Dean Hildreth as a committed chair with a clear vision for the department: focus on microbiology in the Hawaiian context both in terms of microbes and pathogens as well as the needs of the students. He also appears to understand the importance of coordinating research and teaching efforts across the life science departments in CNS. Dean Hildreth met with two very senior tenured faculty members in Microbiology including a former chair. This discussion revealed a low but improving morale in the department, a perception that faculty have little input in decisions impacting the department and evidence of serious interpersonal challenges in this small department. It was also clear that the poor condition of facilities continues to be a great concern for the faculty. The faculty members also complained
that there is “almost no support for research” and that pre-award and post-award services are severely lacking.

Dean Hildreth’s meeting with the graduate students confirmed that the climate in Microbiology is suboptimal. The students indicated that the tension between Microbiology faculty was such that they tried to “keep their heads down” and that they felt like they had to remain in their “silos”. The students also expressed great concern about the courses offered and puzzled over the fact that no required courses are specified. Two of the students indicated that it was possible to be asked questions in a qualifying exam about material not covered in the courses offered. The students also expressed concern over the low stipend levels and the fact that graduate students in some programs such as SOEST receive much higher stipends than they do. Dean Hildreth met with a single undergraduate student in the Microbiology major, a senior from California. She was overall very pleased with her experience in CNS but complained that there were few internships available and that students are not encouraged to do research.

**Recommendation:** The climate in Microbiology appears to be impacting the graduate students to a considerable degree. A formal assessment of the climate is warranted (this could be done as part of the college-level climate survey recommended above) and depending on the outcome, consideration should be given to hiring a facilitator to address important issues. It is also recommended that the department chair hold regular faculty meetings to allow members to express their concerns and ideas and also be kept abreast on issues germane to the department.

**Research and Graduate Education**

The research productivity of the faculty is modest at best. Over the last five years there has been only a single NIH grant (R21) among the entire faculty and based on the data provided, the overall extramural support has averaged ~$80,000 per year per faculty member. It was difficult to assess the overall quality of the scholarship of the department based on the materials provided. The self-study indicated that Microbiology faculty members are publishing in top journals such as *Nature* and *Science* but a faculty bibliography was not provided. The faculty members expressed concerns regarding research support at both the departmental and university level, especially for pre-award support. The poor condition of the facilities and outdated equipment were also referenced as issues. The administrative bureaucracy was indicated to be a major impediment to performing the expected duties of faculty including competing for extramural funding.

The graduate program in Microbiology is modest in size enrolling a total of 25 students in MS and PhD programs. Between 2007 and 2012, 14 PhD and 24 MS degrees were awarded. Support for graduate students appears to be primarily teaching assistantships with some students also supported by graduate research assistantships, especially those in laboratories of faculty in the School of Medicine.
Recommendation: The department should be very strategic in hiring new faculty in well-defined focus areas that build on existing strengths in the department and other units within CNS. Collaborative research programs with Botany and Biology should be considered that leverage resources and create added value for faculty and students.

Recommendation: The department should develop a plan to revise policies regarding graduate students and their training. As mentioned above, the college-wide issue of low support for graduate students must be addressed. At the level of the department, increased extramural support of faculty will allow more students to be supported by research assistantships. The department should work to ensure that graduate students have access to an adequate number of courses to prepare them for their qualifying examinations. The department should develop a specific plan to ensure the appropriate environment (collegial, collaborative, nurturing) for enrolled graduate students.

Undergraduate Education

The number of SSH taught by the Microbiology faculty members has steadily declined since 2007 from 2,230 to the current level of 1,887. The lower division instruction is provided solely to non-majors and 66% of the upper division instruction is provided to non-majors. A total of 154 undergraduates are enrolled in department majors: Microbiology and Molecular and Cellular Biology. The latter major was offered for the first time in 2011. The program initially was created with existing courses and with the addition of a new course in cancer biology. This new major does not appear to incorporate any curricula innovations and the existing major Microbiology does not appear to have been revised in any substantive way since the last review. Since only a single student attended the meeting with Dean Hildreth it is difficult to assess the student perspectives regarding the majors offered by the Microbiology department.

Recommendation: The department should work to increase the exposure of undergraduates to research and take steps to increase opportunities for internships. The failure of undergraduate students to attend the pre-arranged meeting with Dean Hildreth is assumed to reflect a disengagement of undergraduates in the life of the department and college. The department should consider ways to correct this such as faculty-student luncheons, faculty-advised clubs, social events and freshmen seminars.

Collaboration

There was very little evidence of research collaborations between Microbiology and other units on campus. The Chair indicated that a joint hire was being pursued with the School of Medicine and this would be an exciting development.

Recommendation: It is recommended that the department consider developing research programs with the other life sciences departments in CNS. There are obvious areas that could be pursued including environmental microbiology and synthetic biology among others. Inter-
unit collaborations could lead to multi-investigator grants in the grand challenge areas (food, health, environment) and also contribute to an exciting training environment for students. Such interactions would also provide for leveraging limited resources especially with respect to instrumentation.

Diversity

The Department of Microbiology has no women among its faculty members. Furthermore, there appears to be no coherent plan to address this issue. This is not in keeping with expectations of departments at peer institutions to which this department aspires. Not having a plan to correct this problem is unacceptable.

Recommendation: The department should develop a comprehensive plan to recruit and retain a diverse faculty. Specific steps should include implicit bias training for search committee members as well as making the search committee itself as diverse as possible including women. Additional steps should include making every effort possible to ensure a diverse applicant pool.
The Department of Physics and Astronomy arguably has the strongest external reputation of any department in the College of Natural Sciences. The department has 21 tenured and tenure-track faculty members, including the CNS Dean. The department has two female faculty members, Assistant Professors Veronica Bindi and Jelena Maricic. The department has plans to grow faculty FTE by 6 over the next five years. Faculty expertise is distributed across the sub-disciplines of physics and hiring is planned to be across the sub-disciplines.

The external review team was provided with the following material about the Department of Physics and Astronomy prior to the campus visit: a self-study report, a data workbook, assessment reports dating back to 2009, and the results of graduate and undergraduate student surveys. The curricula vita of faculty members were not provided (the web link to Appendix B of the self-study was inoperative), but appropriate background material was generally available via faculty web pages. During the review the departmental reviewer, Dean Jeffrey Roberts, met with the Chair of Physics and Astronomy (Prof. Pui Lam), with members of the Physics and Astronomy faculty (most faculty members were present), with approximately 8 graduate students from the department, and with about the same number of undergraduate students. Prof. Lam took Dean Roberts on a tour of some of the department’s teaching and research laboratories.

The committee’s overall assessment of the Department of Physics and Astronomy is that it appears to be on a steady course, and that it has benefited from an effective department chair and an ability to hire new faculty members. The committee encourages the department to be more careful and intentional about community building and long-range planning. The undergraduate program would benefit from a stronger emphasis on all aspects of undergraduate student success, to include curricular innovation, the creation of more professional development opportunities including undergraduate research, and more efforts at community building. The graduate program would similarly benefit from increased attention to certain areas, including the nature and level of graduate support, and the climate experienced by some students.

Based upon the discussions with students, faculty and staff, the following key issues arose:

**Department Culture**

During Dean Roberts’ meeting with physics and astronomy faculty, the faculty expressed a great deal of confidence in and admiration for CNS Dean Ditto. There appeared to be a good level of collegiality among the faculty. Dean Roberts was generally impressed by Prof. Lam’s leadership of the department. The dean and department chair appear to work well together. Except for Prof. Lam, the department’s leadership ranks appear to be thin.

More than one graduate student reported a hostile culture, and expressed the opinion that weaker students are abusively or dismissively treated by some faculty members. Some students
expressed concerns about an unwelcome environment for female graduate students. It is important to report that at least two students reported a very positive experience in the department, although they acknowledged that the complaints of some of their colleagues did have some legitimacy.

**Recommendation:** Assess the departmental climate as it impacts faculty, staff, and students in the Department of Physics and Astronomy. (This can be done as part of a college-wide assessment as recommended above.) Dean Roberts learned that some departmental stakeholders perceive a chilly and hostile climate. The review team could not confirm that this is the case, but it was concerned enough to believe that a careful assessment would be valuable. If serious climate issues are uncovered, the Vice Chancellor should consider hiring an outside facilitator to address the most important issues.

**Research and Graduate Education**

The department has been careful to recruit exceptional faculty members to Hawaii; the overall record of faculty accomplishment before coming to Hawaii is generally consistent with what is seen at top-ranked departments. The free-electron laser group has a strong international reputation; a decision by the university roughly 15 years ago to invest in this small but focused area appears to have paid dividends in helping increase department stature. The department also has significant strength in high energy theory and, especially, experimental physics. The department’s standard 2:1 teaching load is in line with the load at comparably ranked graduate degree-granting departments, although the self-study is correct that the teaching load may be an impediment to increasing research productivity. The department did not provide sufficient information for the review team to assess the department’s collective publication record. Annual research expenditures in the period between 2008 and 2013 have averaged $3,300,000. This appears to correspond to an average of $165,000 in annual support per faculty member. The self-study did not provide enough information to assess how funding is distributed among faculty members.

Faculty expressed concerns about low TA stipends and their impact on the ability to recruit graduate students, the bureaucratic challenges associated with accomplishing routine faculty work (proposal submission, procurement, and so on), and a perception of top-down micromanagement in certain recent hiring initiatives that have impacted Physics and Astronomy.

The graduate program in the Department of Physics and Astronomy is mid-sized, with 86 currently enrolled graduate students (all in the Ph.D. program), with roughly equal numbers of students in the Physics and Astronomy degree programs. From the reported “quantitative indicators,” only 22 of 210 students who had enrolled in the physics or astronomy graduate programs between 2003 and 2013 left the university without a degree, and 33 graduated from programs in other departments. The department awarded 53 Ph.D.’s between 2003 and 2013. The relatively low level of student attrition is taken by the review team as a sign of a healthy graduate program. Graduate student support appears to be largely in the form of teaching
assistantships during the academic year for students who have not passed the qualifying exam, with increased availability of research assistantships for senior graduate students. Approximately 8 graduate students met with Dean Roberts in the time set aside for that purpose. Serious concerns were expressed about the level of graduate support, and especially about the perception that students in the Institute for Astronomy (IfA) are substantially better supported than are graduate students in Physics and Astronomy. Some students reported that they felt that offer letters were disingenuous in the way they described summer support, and others were angry about payroll delays.

**Recommendation:** The department should carefully examine its current policies and practices regarding the graduate program. In addition to the college-wide issue of inadequate financial support, two areas are of particular concern. First, graduate students reported a lack of transparency and some unfairness in offer letters written to prospective students, and in the treatment of current graduate students. Second, the department needs to develop a way to address the extreme resentment felt by some graduate students regarding the graduate students support levels offered by IfA. Unless the department is able to meaningfully deal with this issue, perhaps in collaboration with the dean and vice chancellor, it is easy to imagine that student resentment will continue to fester, and that morale problems will increase.

**Undergraduate Education**

As is the case at almost any public university, the Department of Physics and Astronomy plays an important service teaching role. Lower division instruction has increased over the past several years, from 3,983 SSH in 2007-08 to 4,846 in 2012-13. Over 95% of lower division instruction is provided to non-majors. The number of physics majors (both BA and BS tracks are available) has increased by roughly one-third, to 64, over the past two years. The number of majors is consistent with or perhaps a little larger than what would typically be found at peer institutions. The department is to be applauded for collaborating with the Institute for Astronomy (IfA) in creating a BA and BS programs in Astronomy and Astrophysics, respectively. If approved, these programs, which leverage the strength and prestige of Physics/Astronomy and IfA, have the potential to increase the department’s ability to recruit talented undergraduate students.

Physics and Astronomy undergraduates expressed a mixed set of opinions regarding their experiences in the department. One area of widespread agreement is that some faculty members are perceived as being “too busy with research” to interact meaningfully with undergraduates. Students described a generally low level of interaction with faculty members outside of the classroom. There did not appear to be a high level of camaraderie among students. Students reported that the physics club is small and weak, and that it is not supported financially by the department or have an involved faculty advisor. Students also reported that they were not informed about undergraduate research experiences on and away from campus, and that they felt at sea in thinking about whether and how to apply to graduate school.
Recommendation: The department should develop and implement simple strategies (faculty-advised clubs, social events, journal groups, etc.) that might bring undergraduates and faculty together for informal interactions.

Collaboration

Faculty were pleased at the Dean Ditto’s efforts to expand faculty recruiting. Departmental culture appears to be somewhat insular, and there are few apparent faculty collaborations except for some very important interactions with IfA. The department does not fully appreciate the potential advantages of broadly collaborating across campus.

Recommendation: Rethink the current departmentally-focused hiring plan, and consider whether an emphasis on broad “grand challenge” areas involving multiple departments and colleges might be a better route to success than standard disciplinary hiring. There are unrealized opportunities for collaboration within and outside the department. The ability to compete for large multi-investigator grants, to recruit top graduate students, and to grow the department’s stature will require the development of a more collaborative and entrepreneurial faculty culture. The department will continue to be relatively small compared to its aspirational peers for the foreseeable future. This makes it even more important to encourage the growth of scholarly communities that extend beyond the sub-disciplines.

Diversity

The fraction of women tenured/tenure-track faculty members in the department (2 of 21) considerably lags what is generally found in peer and aspirational peer departments. The committee recognizes the challenges in recruiting women into science departments. However, the department appears to do little proactively in this regard.

Recommendation: Develop a comprehensive strategy for recruiting and retaining a more diverse faculty in the Department of Physics and Astronomy. Possible approaches might include additional search committee training and broader search committee membership, avoiding whenever possible narrowly focused searches, and more vigorous efforts to identify potential applicant pools.